tribunals has been impugned, that they are not concerned with the question whether an adjudicator was in fact biased. The reason for this attitude is presumably that it would be unseemly for the court to purport to pry into the state of mind of any judicial officer. Even where the evidence adduced has pointed strongly to the inference that an adjudicator was in fact biased, the courts have confined themselves to determining whether a likelihood of bias has been established. And this question is to be answered by inferences drawn from the circumstances. Probably, however, there is no rule of law which absolutely precludes a court from holding that an adjudicator was in fact biased. If such a rule exists, it does not extend to review of the conduct of arbitrators. It is open to a party to lead evidence to prove that an independent arbitrator has shown actual bias in favour of the other party, or that an arbitrator who is an employee of the other party has prejudged the issue. In administrative law it is open to a party aggrieved to show that a tribunal disposed of his case under dictation by another authority, or by reference to a predetermined rule of policy without giving any consideration to the merits of his contentions. In such cases the point at issue is usually said to be not whether there was a biased hearing but whether there was any hearing at all; yet the cases could equally well be regarded as exemplifying the materiality of actual bias in administrative law.

. . . .

Real Likelihood of Bias or Reasonable Suspicion of Bias

A "real likelihood" of bias means at least a substantial possibility of bias. The court, it has been said, will judge of the matter 'as a reasonable man would judge of any matter in the conduct of his own business." The test of real likelihood of bias, which has been applied in a number of leading cases in magisterial and liquor licensing law, is based on the reasonable apprehensions of a reasonable man fully appraised of the facts. It is no doubt desirable that all judges, like Caesar's wife, should be above suspicion; but it would be hopeless for the courts to insist that only "people who cannot be suspected of improper motives" were qualified at common law to discharge judicial functions, or to quash decisions on the strength of the suspicions of fools or other capricious and unreasonable people."

The plaintiff's complaints relate only to certain specified instances. Even if his evidence is believed, these do not amount to an arbitrary and capricious conduct of the proceedings.

It appears to me that the Defending Officer's conduct before the Board left much to be desired. The Defending Officer wanted to take the conduct of the proceedings out of the hands of the Chairman and was at times disrespectful to the Chairman and he himself thought that this disrespect might even border on contempt and he apologised to the Board before he made his submissions. The difficulties which the Defending Officer encountered were of his own making. I must say that the Chairman had shown great patience and at the same time he had been firm but fair to the Defending Officer. I can find nothing to criticise the Chairman on his conduct of the proceedings. His rulings were proper. Every opportunity was given to the Defending Officer to present the plaintiff's case.

It is alleged that the Chairman on the last day of the hearing of the inquiry remarked that it was not he who found the plaintiff guilty but that the plaintiff was found guilty. It is suggested that these remarks indicated that the Chairman was acting on the directions of some higher authority in coming to his findings. Both the Chairman and ASP Ee categorically denied that this event ever took place. I do not believe that such an event took place. It would have been foolish and reckless for the Chairman to make such a remark even if he had received directions from higher authority.

The plaintiff's claim is dismissed with costs.

Claim dismissed.

Solicitors: *J.B. Jeyaretnam & Co.*

SINGAPORE FINANCE LTD. v. LIM KAH NGAM (S'PORE) PTE. LTD. & EUGENE H.L. CHAN ASSOCIATES (THIRD PARTY)

[O.C.J. (Lai Kew Chai J.) April 18, 1984]

[Singapore – Civil Suit no. 3675 of 1975]

Torts – Nuisance and negligence – Claim for damages for – Extensive cracks in building – Whether due to excavation works in neighbouring site by defendants – Applicability of common law in Singapore – Civil Law Act (Cap. 30), s.5(2)(a).

Evidence – Expert's evidence – Conflicting evidence – Court's evaluation of – Evidence Act (Cap. 5), s.5.

English Law – Applicability of common law in Singapore – Rule in Acton v. Blundell applicable here.

In mid-January 1974 the defendants were excavating their site enclosed within a cofferdam for 3 basement floors. They were in the course of erecting a 13-storey building. During this period, the owners of buildings in the neighbourhood complained that cracks had appeared in their buildings. The plaintiffs whose building suffered

extensive cracks claimed damages for loss of support, nuisance as well as negligence against the defendants. The plaintiffs alleged that by reason of the excavations, the bottom of the hole, thereby formed, heaved upwards and the ground upon the sides of the cofferdam moved downwards and laterally towards the excavation hold, having passed underneath the sheet piles surrounding the defendants' land, with the consequence that the surface ground in the immediate vicinity subsided and the buildings standing on them therefore suffered cracks.

Throughout the trial, the defendants contended and admitted that ground de-watering of the plaintiffs' soil had been caused by the excavation works. But the defendants and the Third Party maintained that such de-watering, that is the flow of water from the plaintiffs' soil into the excavation hole through indeterminate or undefined channels, was due to the forces of nature and the forces of gravity, and was neither avoidable, given the state of engineering at all material times, nor was it due to any positive acts done by the defendants, their servants or agents. The defendants contended that the damage to the plaintiffs' building was *damnum sine injuria.* The court also heard conflicting experts' evidence on the matter.

Held, dismissing the plaintiffs' claim: (1) the English common law which was first declared in *Acton* v. *Blundell*(1) is received into and is a part of the law of Singapore;

(2) there were undesirable consequences of conferring a legal right on the plaintiff over the flow of subterranean water into his well. The recognition and enforcement of such a right would have unfairly prevented neighbouring owners from draining their land for cultivation, from mining their land for minerals of great value, and from carrying out excavations for the construction of underground buildings and structures which is becoming increasingly necessary;

(3) the court's approach in evaluating the conflicting expert's evidence is to examine the scientific grounds and bases, on which they rely. Where the opinion of an expert is based on reports of facts and empirical observations, the court has to satisfy itself, on a balance of probabilities, whether those facts did in truth exist and whether any inference or inferences drawn from those facts, taken individually and collectively, were sound or not;

(4) in this case, the damage to the plaintiffs' building was caused by differential consolidation settlement brought about by de-watering and this settlement was accentuated by the effect of the mixed foundation of the plaintiffs' building and the abnormal "King Tide". The settlement at the backlane was in part similarly caused and in part by the heavy vehicular traffic at the backlane;

(5) the plaintiffs' claims should be dismissed and the plaintiffs should pay the costs of the Third Party.

Cases referred to:

(1) *Acton* v. *Blundell* (1843) 152 E.R. 1223.
(2) *Mason* v. *Hill* 5 B. & Ad. 1; 110 E.R. 692.
(3) *Langbrook Properties Ltd.* v. *Surrey County Council* [1970] 1 W.L.R. 161.
(4) *Pugliese et al* v. *National Capital Commission* 79 D.L.R. (3d), 592.

CIVIL SUIT.

K.S. Chung for the plaintiffs.
C.S. Wu for the defendants.
P. Selvadurai for the Third Party.

Cur. Adv. Vult.

Lai Kew Chai J.: In mid January 1974 the Defendants were excavating their site enclosed within a cofferdam for 3 basement floors. They were in the course of erecting a 13 storey building. During this period, the owners of buildings in the neighbourhood complained that cracks had appeared in their buildings. Some of the cracks were quite severe. Among the neighbours were the Plaintiffs whose building suffered extensive cracks and who now claim damages for loss of support, nuisance as well as negligence against the Defendants.

Central to the causes of action is the Plaintiffs' allegation that by reason of the excavations, the bottom of the hole thereby formed heaved upwards and the ground upon the sides of the cofferdam moved downwards and laterally towards the excavation hole, having passed underneath the sheet piles surrounding the Defendants' land, with the consequence that the surface ground in the immediate vicinity subsided and the buildings standing on them therefore suffered cracks. In short, the Plaintiffs alleged that some sort of base heave had occurred at the excavation site which, if proved on a balance of probabilities, must mean that the Defendants were liable in law for the withdrawal of support, nuisance and negligence. If negligence is made out, the Third Party who was the consulting Engineer, would be the party primarily responsible and he would have been liable to indemnify the Defendants.

On the other hand, the defence of both the Defendants and the Third Party is that the damage caused to the Plaintiffs' buildings was attributable to differential consolidation settlement brought about by de-watering of their soil and this settlement was accentuated by the effect of the mixed foundation of the Plaintiffs' building and the abnormal "King Tide" which occurred on February 9, 1974. Throughout the trial, the Defendants contended and admitted that ground de-watering of the Plaintiffs' soil had been caused by the excavation works. But the Defendants and the Third Party maintained that such de-watering, that is the flow of water from the plaintiffs' soil into the excavation hole through indeterminate or undefined channels, was due to the forces of nature

and the forces of gravity, and was neither avoidable, given the state of engineering at all material times, nor was it due to any positive acts done by the Defendants, their servants or agents. The damage to the Plaintiffs' building, the Defendants contended, was therefore *damnum sine injuria* or damage without legal injury.

Before I turn to the evidence led during the trial which lasted 36 days bearing on the fundamental question of fact as to what had caused the subsidence to the Plaintiffs' land, I need to set out the common law position in Singapore concerning the liability of a landowner for the flow of the subterranean water from his neighbour's land through undefined channels into his land as a result of an excavation.

It seems to me important to dwell on this particular aspect of the common law which affects neighbouring landowners in Singapore in view of the growing incidence of underground civil engineering works, and, in view of the fact that, as far as I am aware, no judgment has been written in Singapore bearing on this branch of the law.

The position at common law in England was first adumbrated in *Acton* v. *Blundell*[1]. The plaintiff was the owner of a cotton mill. Water supply for the mill was drawn from a well in his property. The defendant in opening a colliery nearby sank two coal pits. Underground water in the plaintiff's land was drawn through undefined channels to the coal pits, causing the plaintiff's well to run dry. The learned trial Judge directed the jury that the plaintiff had no claim in law against the defendant. On an appeal to the Exchequer Chamber, Tindal C.J. confirmed the trial Judge's direction to the jury and said at page 1235:–

"(this case) falls within (the) principle, which gives to the owner of the soil all that lies beneath his surface; that the land immediately below his property, whether it is solid rock, or porous ground, or venous earth, or part soil, part water; that the person who owns the surface may dig therein, and apply all that is there found to his own purposes at his free will and pleasure; and that, if in the exercise of such right, he intercepts or drains off the water collected from underground springs in his neighbour's well, this inconvenience to his neighbour falls within the description of *damnum absque injuria*, which cannot become the ground of an action."

Since this was the first declaration in England of the legal rights and liabilities of and between neighbours *inter se* where there has been an abstraction of subterranean water, it is useful to take a closer look at the reasoning of the court. In that case, the plaintiff sought to argue by analogy and contended that the rule of law governing surface streams ought to apply to subterranean streams. That rule provided that an owner could not diminish the quantity nor injure the quality of the water which naturally flowed through his land nor throw back the water without the licence or grant of the owner further up, although the owner had the right to the advantage of the stream flowing in its natural course and to use it for any purposes as he pleased, not inconsistent with a similar right of the owners upstream and downstream: see *Mason* v. *Hill*[2]. This argument was rejected because the foundation and origin of the rule governing surface streams were inapplicable to underground water.

The court was very much influenced by the undesirable consequences of conferring a legal right on the plaintiff over the flow of subterranean water into his well. The recognition and enforcement of such a right would have unfairly prevented neighbouring owners from draining their land for cultivation, from mining their land for minerals of great value, and, I may add, from carrying out excavations for the construction of underground buildings and structures which is becoming increasingly necessary. The court found support for the soundness of this principle by referring to the similar position under Roman Law which, though not forming part of the law of England, was recognised as the fruit of the researches of the most learned men.

I should now refer to the authority of *Langbrook Properties Ltd.* v. *Surrey County Council*[3] on which the Defendants before me had placed great reliance. It was there alleged that by pumping out excavations on land in the vicinity of the plaintiffs' land the defendants had abstracted water percolating beneath the plaintiffs' land and the abstracting of the water had caused settlement of the plaintiffs' buildings. At the trial of a preliminary issue whether, on the facts as pleaded in the statement of claim, the plaintiffs had any cause of action, it was held by Plowman J. that the plaintiffs had no cause of action since the defendants were entitled to abstract the water under their land percolating in undefined channels to whatever extent they chose, notwithstanding that this resulted in the abstraction of water percolating under the plaintiffs' land and thereby caused them injury. He held that any damage suffered by the plaintiffs was *damnum sine injuria*.

In the course of his judgment, Plowman J. reviewed the past English authorities with admirable dexterity and came to the following conclusion at page 178:—

"The authorities cited on behalf of the defendants in my judgment establish that a man may abstract the water under his land which percolates in undefined channels to whatever extent he pleases, notwithstanding that this may result in the abstraction of water percolating under the land of his neighbour and, thereby, cause him injury. In such circumstances the principle of *sic utere tuo ut alienum non laedas* (i.e. use your own property so as not to injure that of another) does not operate and the damage is *damnum sine injuria.*"

On the facts as alleged in the statement of claim, which Plowman J. had to assume as proved, the question arose whether there was any room for the law of nuisance or negligence to operate. In explaining the reasons why he thought there was no room for the law of nuisance or negligence to operate, he said at pages 178 and 179:—

"In the first place, if there were, it seems to me highly probable that the courts would already have said so, and yet I have not been referred to any case in which that was done. In *Chasemore* v. *Richards* (1859) 7 H.L. Cas. 349 the opportunity was there, since the water authority concerned was found to have had reasonable means of knowing the natural and probable consequences of their excavations, but there was no suggestion in the House of Lords that this was a relevant matter.

Moreover, since it is not actionable to cause damage by the abstraction of underground water, even where this is done maliciously, it would seem illogical that it should be actionable if it were done carelessly. Where there is no duty not to injure for the sake of inflicting injury, there cannot, in my judgment, be a duty to take care not to inflict the same injury.

A claim in nuisance can fare no better, since nuisance involves an unlawful interference with a man's use or enjoyment of land (see *Winfield* on Tort, 8th ed., at p.353 and cases there cited) but here the interference was not unlawful, as the authorities referred to show.

On the facts which I am required to assume (which may not be the real facts) this may be thought to be an unsatisfactory result. If indeed the defendants could have avoided damaging the plaintiffs' property by the exercise of reasonable care, it may be asked why they should not be liable for their failure to do so. But so far, at any rate, as a court of first instance is concerned, it must, I think, be taken as settled that the restrictions which the law imposes on a landowner's freedom of action for the benefit of his neighbours are not such as to give the plaintiffs a cause of action in this case."

It has been debated before me whether the English common law relating to the abstraction of or interference with the flow of underground water as compendiously summarised by Plowman J. in *Langbrook's case* is part of the common law of our land. In this connection, I want to place on record that I am indebted to Mr. C.S. Wu, counsel for the Defendants, who, in conformity with the best traditions of the Bar, quite properly and candidly drew my attention to a string of authorities which were decided in Australia, Canada and the United States, all of which have, to a degree, departed from the common law of England.

I need only for present purposes refer to the 1977 decision of the Ontario Court of Appeal in *Pugliese et al.* v. *National Capital Commission*[4]. The defendants were engaged in the construction of a collection sewer. They had to control the ground water conditions. They did so by pumping subterranean water from the deep drainage which they had built. The pumping lowered the ground water in the vicinity which caused ground consolidation and this, in turn, caused differential settlement over the base of the plaintiffs' homes. The homes suffered cracks and faulting.

On a reference to the Ontario Court of Appeal to determine the point of law raised in the pleadings, the court made an extensive review in the law in all four jurisdictions and came to the conclusion that the law in England should not be applied without reference to the modern law of negligence and nuisance.

In my considered opinion, the English common law which was first declared in *Acton* v. *Blundell* is received into and is a part of the law of Singapore. Having regard to the reasons in support of the rule in *Acton* v. *Blundell* which I had examined and which operate with particular force and validity between neighbouring owners, whose respective rights have to be given due weight and carefully balanced, I am of the view that the Canadian case of *Pugliese* has no application to and bears a crucial distinction from the case before me. The parties before me are neighbours of such sufficient physical proximity that the reasons operative in *Acton* v. *Blundell* are equally compelling. In the Canadian case, the parties were not neighbours. Unlike the present Defendants who were exercising their ownership rights to excavate and build on their own land, the defendant Commission in the Canadian case was carrying out a public project for the benefit of the public at large. Whether homeowners in those circumstances should go without remedy does not arise in the case before me. Also, the pronouncements in that case bearing on negli-

gence have no relevance to the case before me, having regard to what I will be saying later on this aspect of the case.

I am also not persuaded by the argument of counsel for the Plaintiffs that the provisions of section 5(2)(a) of the Civil Law Act (Cap. 30) exclude from Singapore the reception of the rule in *Acton* v. *Blundell.*

Having set out the legal position, I now turn to the facts of this case and to the fundamental question as to what had caused the settlement of the Plaintiffs' land and building. The Plaintiffs' claim is that the settlement of their land was caused by the phenomenon known as base heave. To make good their claim, they rely on the evidence of their expert witness, Professor Chin Fung Kee, who practises as a Consultant Engineer on soil mechanics and foundation problems. His academic and professional qualifications are most impressive and difficult to surpass. In 1946 he was awarded a Queen's scholarship. In 1952 he obtained the degree of Bachelor of Science in Civil Engineering with First Class Honours from Belfast University. In the following year, he obtained his Masters degree. Over the ensuing years, he became a Member and later a Fellow of both the Institution of Structural Engineers, U.K. and the Institution of Civil Engineers, U.K. In 1977 he was made the Honorary Fellow of the Institution of Civil Enginners, U.K. He remains the only Asian who holds this distinction.

For sometime, Professor Chin was in the academe. He obtained his professorship in Civil Engineering in 1961, University of Malaya, Kuala Lumpur, where he was elected as the Dean of the Faculty of Engineering. In 1975, he was conferred the Honorary Doctorate of Science by the then University of Singapore. He has published more than 50 papers on Soil Mechanics and Foundation problems in international journals.

Professor Chin was instructed in July 1974 to investigate into and report on the cause of the damage to the Plaintiffs' building. He visited the site on July 25, 1974 and in his report of July 31, 1974 he expressed his opinion in the following terms:—

"The structural damage sustained by the (Plaintiffs') building is the result of excessive settlement. This settlement is brought about by:—

(a) The deep excavation that was carried out at the building site at the rear;

(b) Pumping and de-watering; and

(c) Vibration due to piling in an area of deep excavation."

The Professor then went on to describe the phenomenon known as bottom heave which he alleged had occurred on the Defendants' excavation site. He described it as follows:—

"Saturated plastic clay such as that underlying the area concerned experience a consistent pattern of deformation as material is removed from the space between the walls of the basement excavation. Excavation for the basement reduces the load on the soil beneath the cut, whereupon the underlying soil tends to move upward. The soil in the neighbourhood surrounding the basement excavation (i.e. the Plaintiffs' land), on the other hand, tends to sink and to move inward even at levels below that to which the cut has progressed. On account of the rise of the bottom of the basement excavation and the inward lateral and downward movement, the ground surrounding the cut subsides."

This opinion necessarily implies that the Defendants' cofferdam designed by the Third Party was defective in that it had failed to prevent a bottom heave.

The Professor conducted his site inspection on July 25, 1974 and it took him about two hours. He inspected the damage to the Plaintiffs' building and studied the strips of paper "tell-tales" which had been affixed over the cracks. He also inspected the backlane which separated the properties of the Plaintiffs and of the Defendants. He said in evidence that the depth of the Defendants' excavation struck him as excessive. He also said that the level of the whole of the backlane had suffered a 4" to 6" subsidence, suggesting that this was due to the bottom heave. He also took note of a patch of white cementation shown in a photograph, exhibit P19, which he said was evidence of ground settlement repair. With regard to a row of Defendants' sheet piles along the backlane, the Professor told the court that the mid section was lower and out of line slightly towards the backlane. The maximum misalignment was, he claimed, about 4 inches. To him, this was a significant movement of the sheet piles in relation to the others.

In support of his opinion that there had been sheet pile failures followed by a bottom heave, the Professor referred me to his calculations based on two formulae. The first is known as the *Rankine* formula which determines the critical depth for sheet pile failure. The second is known as the *Teng* formula which determines the critical depth at which a bottom heave would occur. On the basis of the *Rankine* formula, he expressed the opinion

that the sheet piles would have failed when excavation reached the depths of between 9 ft. 2 inches and 15 ft. 4 inches. On the basis of the *Teng* formula, he concluded that bottom heave would have occurred at an excavation depth of between 16.8 ft. to 17.7 ft.

I now turn to the evidence led by the Defendants. The Defendants, who are building contractors with a remarkable track record, bought the site in 1972. They erected on the land a 13 storey building which was completed towards the end of 1976. The building included three basement floors, for which extensive excavations had to be undertaken over an area of 99 ft. by 77 ft. The project architects were Pan Malaysian Architects and the Third Party was engaged as the consultant engineer responsible for the engineering aspects of the building, including the design of the basements.

The Third Party designed the piling work. About 120 steel H piles were sunk to depths of 120 ft. at the Cecil Street end and 130 ft. at the backlane end. They were driven to set, that is to firm ground. By end of April 1973 the driving of the load bearing piles were completed.

According to Mr. Lim Kong Eng, the Defendants' Managing Director, himself an engineer, the Defendants next drove sheet piles along the four sides of their site. They started driving the sheet piles on August 28, 1973 and completed this phase of the work on November 12, 1973. They were driven to 57½ ft. according to design. The length of the sheet piles were 60 ft. After that, excavation work commenced on November 16, 1973. The original design depths of excavation were 32½ ft. at the backlane end and 29 ft. at the Cecil Street end. The cofferdam was braced and strutted as provided for in the design. The excavation was done simultaneously with the bracing and strutting of the sheet piles, layer by layer. The excavation was done sectionally at each layer. The first layer of struts at a depth of 6 ft. were completed on December 25, 1973. By January 18, 1974 the second layer of struts at the depth of 15 ft. were completed. During this period the Defendants received complaints from their neighbours that cracks were appearing in their building. After the Chinese New Year holidays, excavation works resumed on February 6, 1974. On the following day, the Plaintiffs lodged with them their first letter of complaint of damage to their buildings.

On February 9, 1974 a "King Tide" flood occurred in Singapore. The flood waters in the Robinson Road and Cecil Street area were over 2½ ft. above ground level. They overflowed into the excavation. Immediately after the flood, the Defendants received more complaints from the neighbours. The cracks worsened and the worsening suffered by the plaintiffs' building was the most severe.

Towards the end of January 1974 the Defendants discussed with their Architects and the Third Party on the possibility of reducing the depth of the excavation at the backlane end by 5 ft., so that excavation at that end would be taken down to only 28 ft., the additional half foot being for trimming the ground. By February 21, 1974 the decision was made to reduce the depth of excavation at the backlane end of the site. The Architects then wrote to the Chief Planner for permission to revise the approved plans. As the Plaintiffs' cross-examination on the letter was extensive, I am quoting the letter (Exhibit D9) in full:–

> "We refer to the above planning approval under D.C. 227/70, the building plans of which under B.P. 1276B/71 was approved on February 8, 1974 by the Assistant Director. As a matter of extreme urgency we are writing to enquire whether you would permit the deletion of one basement (15 car parks) in view of the serious settlement during excavation. We would earnestly request you to have a personal inspection of the existing conditions. It is our Consulting Engineers' and our opinion that further excavation would endanger the adjoining buildings. We have now reached the level of the 2nd basement and if the basement can now be concreted without further excavation, there will be little likelihood of further movement. On the other hand further excavation may prove to be perilous.
>
> As the matter is of extremely urgent nature, we would appreciate it if you could let us have your decision soonest possible."

At the time the letter was written by the Architects to the Chief Planner, the excavation at the backlane end was still at a depth of 15 ft. Permission to reduce the level was granted. By the end of March 1974 the excavation was completed to formation level down to the revised depth at the backlane end. The basement comprised the erection of a raft foundation of 5 ft. thick and was reinforced. It extended across the entire floor of the basement. Before its construction, the soil was trimmed to the design level within the usual span of time and without interruption, a task which would have been impossible if the critical depth had been exceeded followed by sheet pile failures and a bottom heave, as was alleged by Professor Chin. A layer of lean concrete blinding was then laid on the

trimmed surface. The lean concrete was 3" thick. it was then left to harden, after which it provided a clean working surface. On top of this lean layer was laid the 5 foot thick raft foundation.

According to Mr. Lim Kong Eng, the Defendants did not encounter any extraordinary difficulty and work had progressed in the usual way. The raft foundation was completed by the end of May 1974. After the raft foundation was completed, the Defendants erected the four basement walls to replace the struts and bracings. The third level of walers at the backlane end had to be cast in and left within the raft. As a result, the wall there was thicker between the raft and the 2nd basement.

By November 1974 the construction reached ground floor level. Superstructure work then began and the 13 storey building with the three basement floors were successfully completed in November 1976.

I now set out my evaluation of the expert and other evidence produced by the parties before me which bear on the question as to the operative cause or causes of the settlement of the Plaintiffs' land.

The conflicting experts' evidence given before me were received under section 47 of the Evidence Act, (Cap. 5). My approach in evaluating the conflicting experts' evidence is to examine the scientific grounds and bases, on which they rely, in connection with (a) the permeability of the first stratum of the soil in the vicinity; (b) the applicability of the *Rankine* formula and *Teng* formula relating to sheet pile failure and the occurrence of base heave; (c) the behaviour of underground water in the de-watering process; and (d) the nature of the plaintiffs' building and foundation and the effect on them of any ground settlement. Where the opinion of an expert is based on reports of facts and empirical observations, I have endeavoured to satisfy myself, on a balance of probabilities, whether those facts did in truth exist and whether any inference or inferences drawn from those facts, taken individually and collectively, were sound or not. In this context, what had in fact happened in the course of the Defendants' excavations and its effect on the ground in the immediate neighbourhood were vital matters of fact upon which I have to make my findings.

Professor Chin's opinion that bottom heave had occurred was based on (1) his conclusion that the soil in the area and underneath the land of the Plaintiffs and the Defendants, being a natural deposit of clay, was impermeable to water so that consolidation settlement due to ground de-watering was, and must necessarily be excluded; (2) his investigations; and (3) his calculations according to the two formulae which I had mentioned earlier in my judgment. The Professor had assumed that the first stratum of soil was impermeable. He said in evidence that the clay from 3 ft. to 20 ft. was a natural deposit and was not fill material. He was confronted with the soil investigations reports which had described the first stratum as fill material. He stoutly replied that the statement was inaccurate. When asked about the presence of gravel in the first stratum, he said it was placed on top of the clay which trickled downwards over geological time. The Professor in cross-examination was shown the Singapore 1843 Shoreline in Exhibit D13 which showed the area at that period as lying within a part of the sea. He was then asked to estimate the estimated depth of the fill and he suggested a depth of only 5 ft.

The Professor also rejected two pieces of evidence which showed that the first stratum of the soil down to about 20 ft. was fill material, having been reclaimed. He rejected the estimated water table given as 6 ft. below ground. He said that there was no question of a water table since the soil was all clay. Numerous photographs were produced showing the difference between the fill stratum and the marine clay stratum of the soil in the area. He did not accept the differences which were quite apparent.

It would appear that the Professor was not himself totally convinced that the first stratum of the soil was impervious to water. In his written opinion, he had attributed the settlement in part to "pumping and de-watering". But he said he did not intend by the phrase to refer to underground de-watering. His explanation that by the expression he meant the vibrations caused by the process of pumping was unacceptable to me.

In establishing the permeability of the first stratum of the soil in the area, the Defendants tendered a formidable body of evidence. They called Mr. John Thomas Stevens, a consultant civil engineer. In the course of his work, he too had acquired an extensive experience in foundation works. He prepared for this court a paper bearing the title: "The effect of water on soil behaviour." In foundation engineering, he asserted, and I accept, that fill material is generally assumed to be permeable to

water despite the fact that it may contain a significant proportion of clay: see also *Terzaghi & Peck* at page 156. He explained that when excavation is to a depth say 30 ft. below the water table, three things would happen, namely: (1) the soil within the excavation pit, laden with water in its pores, is removed; (2) the ground water level outside the cofferdam (if there is such a construction) becomes progressively higher than the level of water within the cofferdam, as water accumulation within the cofferdam is removed by pumping; and (3) the soil load outside the cofferdam is progressively increased as excavation within the cofferdam deepens. He goes on to explain as follows:

"17. The combination of these matters activates the hydraulic forces of the soil water content outside the cofferdam in the stratum between the ground water level and the level of the excavation (the Piezometric level) causing the soil water content in this stratum to seep through the clutches of the sheet piles (which cannot be regarded as watertight) and into the excavation pit. The deeper the excavation, the greater the activation of the hydraulic forces.

18. The water seepage is routed along undefined channels in the ground provided by soil components of greater permeability. Where clay is encountered, its "blocking" effect (on account of its low permeability) causes the water to re-route and seek other and more permeable channels towards the excavation."

The following passage from *Terzaghi & Peck* at page 581 explains with great clarity the relationship between deep excavation and ground settlement:

"ART. 59 Settlement due to Lowering the Water Table Causes of Settlement.

Whenever a large open excavation is to be made below the water table by any process other than dredging or the sinking of a caisson by the compressed-air method, the water table must be temporarily lowered by pumping. By lowering the water table the effective load on the subsoil is increased by an amount equal to the difference between the drained weight (solid and soil moisture combined) and the submerged weight of the entire mass of soil located between the original and the lowered water table. The increase of the effective overburden pressure causes additional compression. This, in turn, produces a settlement that at every point is roughly proportional to the descent of the piezometric level at that point. For a given descent the settlement depends on the compressibility of the subsoil."

I understand this part of the evidence to describe in layman terms, shorn of all the technicalities, the process in which water in the soil will find its way to its lowest level through undefined channels as a result of which the soil from which it had flowed would settle and consolidate.

The second soil report, Exhibit P1, disclosed that all five samples taken of the first stratum of the soil were not susceptible to the usual soil tests because their disturbed state "was due to the high percentage of gravels and stones in this fill." The Plaintiffs' engineer, Mr. Ho Hweng Sheng, who was called in to study the cause of the cracks and to recommend remedial works, had in two reports in writing in February 1974 attributed the settlement to ground de-watering. In addition, Mr. Lim Kong Eng and the Third Party, who were regularly at the excavation site, testified that after the excavation had proceeded below the water table level of 6 ft., they had observed constant seepage of water between the clutches of the sheet piles. Their evidence, which I accept, showed that water seepage had occurred and I accordingly find that the first stratum of soil was not natural deposits of clay but was fill material which was permeable.

I must now refer to the observations of Professor Chin made during his inspection and examine if his inferences were valid. The Professor concluded that the misalignment of the middle section of the sheet piles at the backlane end of the excavation were "significant movements" and evidence of sheet pile failure. Both Mr. Lim Kong Eng and the the Third Party had explained that the kind of misalignment observed by the Professor was unavoidable and perfectly normal. It was apparent, even before any excavation work had begun: see Exhibit TP15 (ER2). Moreover, the Professor in forming his opinion failed to make a study of the cofferdam design nor carry out an enquiry into the design considerations of the Third Party. Accordingly, his inference that there was a sheet pile failure was, in my view, too tenuous.

The Professor also claimed that the cementatious white patch at the backlane represented ground settlement repairs. Both Mr. Lim Kong Eng and the Third Party told the court that the patch was the cement used to cover the pipes which were laid for the worker's lavatory. The Professor's riposte was that "the width need not have been so wide."

The way the Plaintiffs led a piece of evidence, which they inconclusively abandoned when they encountered heavy weather, must now be referred to. The evidence related to the depth of the excavation at the backlane end and actually carried out by the Defendants. In the cross-examination of the Professor, it was pointedly suggested to him that if bottom heave had occurred at the depth of excavation of around 16-17 ft, the Defendants could not

have excavated successfully down to the reduced level of 28 ft. In the closing stages of his re-examination, the Professor made the surprising claim that the Defendants' excavation at the backlane end had in fact gone down to a level of only 22.18 ft. and not 28 ft. as the Defendants had claimed. He even drew a sketch to illustrate his claim. I was therefore constrained to order a joint basement inspection at the end of which I found that the excavated level was in truth and in fact 28 ft. and that it was a wholly unnecessary diversion.

The Plaintiffs were stubbornly undeterred and, on their application, I gave leave to them to conduct a survey to establish the as built levels of the basements. The survey was carried out by a registered surveyor. But counsel for the Plaintiffs at the close of the Defendants' case informed me that he would not lead any evidence on the survey nor produce the survey drawings. I am therefore irresistibly drawn to the conclusion that the excavation level at the backlane end did go down to 28 ft. and that there was no evidence whatsoever from the comprehensive survey to suggest that there was any significant sheet pile movement.

The Professor explained that his study of one of the plans submitted to the Chief Planner showed that the basement details were totally omitted. But the relevant plans contained the words "To engineers' details." I am afraid that the Professor was again too quick to jump to conclusions.

The Defendants and the Third Party produced evidence to show that Professor Chin had misapplied the *Rankine* formula in connection with sheet pile failure and the *Teng* formula as regards the occurrence of bottom heave. The Third Party callled Mr. Eric Rawcliffe, a civil engineer, as his expert. Mr. Rawcliffe expressed the firm view that the *Rankine* formula was not applicable to a braced cofferdam. In *Teng's* chapter on braced cofferdam, it is even stated that the *Rankine* formula could not be applied to a braced cofferdam. Mr. Stevens supported this view. I am convinced by the materials they produced and I accept their opinion. If the *Rankine* formula were applicable, then the sheet piles on all four sides of the cofferdam would have failed from end to end, as the Defendants and Third Party, had submitted, well before the excavation had reached its design levels. I find as a fact that none of the classic signs of sheet pile failure had occurred within and without the cofferdam. The patch of white cementation, one of the empirical observations on which the Professor relied, had nothing to do with any sheet pile failure. Mr. Rawcliffe had calculated that the sheet piles were of sufficient capacity and that all strutting members were satisfactory.

With regard to the applicability of *Teng* formula, I am also driven by the mass of evidence to find that no bottom heave of any kind had occurred. I accept the evidence of both Mr. Lim Kong Eng and the Third Party that they did not encounter any ground swell inside the cofferdam during the excavation. The process of excavation had proceeded apace free from any difficulty. The steel members of the cofferdam remained intact. The joint report of the Third Party and plaintiffs' engineer, Mr. Ho Hweng Sheng, confirmed that the settlement of the Plaintiffs' land and building was arrested by pressure grouting. This suggested that bottom heave had not occurred. If it had, grouting would have aggravated the position and not relieved it.

I must mention that Mr. Rawcliffe's calculations confirmed that the cofferdam was designed with a factor of safety of 1.81 against bottom failure at full excavation depth. At the depth of 20 ft. it was demonstrated that the factor of safety was as high as 2.6. Mr. Rawcliffe had duly considered the hold-down force produced by the presence of the 120 load-bearing piles which were driven to firm ground. Professor Chin had totally disregarded the effect of these piles in his consideration. To the Third Party, this was a prime design consideration. This aspect of Mr. Rawcliffe's evidence was not challenged. The fundamental fact remains that the excavation had proceeded apace without interruption and without any incident. If bottom heave had occurred, the evidence of bottom heave damage and the attendant delay would have been all too obvious.

At the end of the day, counsel for the Plaintiffs was driven, almost in desperation, if I may say so, to make a song and dance about the contents of the letter (Exhibit D9) which the Defendants' architects had written to the Chief Planner to obtain permission to revise and reduce the design depth of the basement at the backlane end by 5 ft. to 28 ft. He strenuously contended that the letter strongly indicated or suggested an admission that base heave had occurred. Neither the context in which, nor the purpose for which, the letter was written bear out the view taken of this letter by the Plaintiffs. The Defendants were most anxious to complete the basement works within the shortest possible time, in view of the worsening damage the ground settlement was causing to the neigh-

bouring buildings. The revision contemplated the deletion of 15 car parking lots, which was frowned upon by the authorities. So, I am not at all surprised if the architects were somewhat hyperbolic in their language. The Defendants' and their professionals' sole concern was to minimise the damage to the neighbours, whatever the view of the legal position was. This is the sort of attitude of a good neighbour which I would heartily approve.

Reference must now be made to the evidence of Mr. Rawcliffe and Mr. Stevens on the renovated nature of the Plaintiffs' building and its mixed foundation. The building was of pre-war construction, having been built in the early 1930s. It originally comprised two buildings, each built on strip foundations, supported by bakau piles which was then the usual foundation for that type of buildings. As a result of renovations carried out in 1966, it became one building. The centre party wall separating the two original buildings was removed and replaced by steel beams and columns. The structure consisted essentially of load bearing brick walls. The upper floors were of 3" x 9" timber floor joists at 1' 9" centres which spanned approximately 20 ft between each load bearing brick wall and a steel joist at the centre of the building. There was a monolithic concrete structure at the rear of the building, comprising a strong room and staircase. It was founded on a simple R.C. raft which was 27-inch thick. It was the opinion of Mr. Rawcliffe that, upon the reconstruction of the two buildings of other owners on either side of the Plaintiffs' building, and the removal of the Plaintiffs' middle party wall, the rear wall of their building had become more vulnerable to any changes which might be brought about by any ground settlement. In all fairness to Mr. Ho Hweng Sheng, who was responsible for the renovation of the Plaintiffs' building, this is not to be taken as any criticism of his design.

Like Mr. Rawcliffe, Mr. Stevens also described the Plaintiffs' foundation as a mixed foundation. Both of them expressed the opinion that such a mixed foundation had a bearing on the likelihood of a differential settlement. Mr. Stevens testified that the main cracks on the two sides of the Plaintiffs' building at the rear had cracked in the base regions and had broadened near the roof. He said that the nature of these cracks, broadening upwards as they did, implied that the building had moved in a convex curve, settling at the backlane. I was persuaded by him that these types of fractures would not be consistent with those caused by a ground heave because a settlement caused by de-watering would be along the phriatic curve, taking a downward tilt towards the cofferdam. I also accept the substantial evidence before me that the cracks had worsened after the freak tide.

Finally, I turn to the particulars of negligence which the Plaintiffs have asserted against the Defendants. These may be dealt with shortly. I do not propose to deal with those particulars which bear a relation to sheet pile failures or ground heave. These are not at all made out in view of my rejection of the Plaintiffs' evidence on sheet pile failure and bottom heave and in view of my finding that in fact the damage to the Plaintiffs' building was caused by differential consolidation settlement brought about by de-watering and this settlement was accentuated by the effect of the mixed foundation of the Plaintiffs' building and the abnormal "King Tide". The settlement at the backlane, which the Professor had observed, was in part similarly caused and in part by the heavy vehicular traffic at the backlane.

However, for completeness, I must refer to the other alleged particulars of negligence. It was alleged that the Defendants had failed to use care in carrying out pumping and de-watering operations. No evidence was led at all. Next, the Plaintiffs complained that the Defendants had failed to provide any vertical or lateral support for the Plaintiffs' building prior to the excavation. Assuming that there was a duty to do so, of which I am not persuaded as the law stands, I am unable to see the efficacy of any such shoring supports. As Mr. Stevens had explained, the props and the building would have moved together when the ground settled. The plaintiffs also sought to blame the Defendants for putting in shallow and insufficient grouting which was part of the remedial works carried out on the joint recommendation of Mr. Ho Hweng Sheng, the Plaintiffs' engineer, and the Third Party. At any rate, it was established that the grouting had effectively arrested the ground settlement. The final complaint was that the Defendants had failed to take any precaution to prevent movements, shocks and vibrations in the said building during the pile driving operations. The damage, in my judgment, had no causal link at all with the piling which was completed some three months earlier.

In all the circumstances, the Plaintiffs' claims are dismissed with costs. As the justice of the case

requires, I also order the Plaintiffs to pay the costs of the Third Party.

Claim dismissed.

Solicitors: *Chung & Co., Donaldson & Burkinshaw; Rodyk & Davidson.*

MALAYSIAN REPORTS

SIVA SEGARA v. PUBLIC PROSECUTOR

[F.C. (Abdul Hamid C.J. (Malaya), Mohamed Azmi & Syed Agil Barakbah F.JJ.) April 16, 1984 & May 7, 1984]

[Kuala Lumpur – Federal Court Criminal Reference No. 1 of 1984]

Criminal Law and Procedure – Unlawful Assembly – Whether knowledge and intention are essential ingredients – Whether section 27(5)(a) of the Police Act 1967 should be read with reference to the other provisions of the section – Interpretation – Police Act, 1967, s. 27

In this case the applicant was one of 42 lawyers who were charged with the offence of taking part in a unlawful assembly in a public place for which no licence was obtained, an offence under section 27(5)(a) of the Police Act, 1967. The learned Magistrate recorded the charge as proved but admonished and discharged the accused under section 173A(ii)(a) of the Criminal Procedure Code. An appeal to the High Court was dismissed (See p. 225 *post*). The applicant was given leave to refer the following questions to the Federal Court under section 66 of the Courts of Judicature Act:–

(1) whether knowledge and intention are essential ingredients to be established before a *prima facie* case can be said to have been made out for the finding of guilt under section 27(5)(a) of the Police Act, 1967; and (2) whether section 27(5)(a) of the Police Act, 1967, can be read without any or any proper reference to all the other provisions of section 27 of the Police Act, 1967.

Held: (1) although there is no express reference to knowledge or intention in section 26(a)(a) of the Police Act, 1967, it cannot be said that an assembly, meeting or procession simpliciter which takes place without a licence becomes in law unlawful;

(2) section 27(5)(a) of the Police Act has to be construed with reference to section 27(2) of the Act. Subsection (2) speaks of an assembly, meeting or procession which is intended to be convened collected etc. in other words an assembly, meeting or procession which is intended to be organised. If therefore a person intends to convene or organise an assembly and he in fact takes part in convening or organizing an assembly envisaged by subsection (2) and that assembly does take place without the convener or organiser first obtaining a licence, such assembly is deemed by law to be an unlawful assembly and the convener or organiser commits an offence under subsection 5(a) of section 27 of the Act. Further and in respect of such assembly, that is the assembly which takes place without a licence issued under the provisions of subsection (2), then whoever takes part in such assembly commits an offence under subsection 5(a) of section 27 of the Act;

(3) knowledge on the part of the person who takes part in such assembly becomes an essential ingredient of the offence and the answer to the first question must therefore be in the affirmative;